View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by Elsevier - Publisher Connector

King Saud University Journal of Dental Sciences (2013) 4, 7–15

King Saud University

King Saud University Journal of Dental Sciences

www.ksu.edu.sa
www.sciencedirect.com

ORIGINAL ARTICLE

Perceived causes of stress among Saudi dental students

Zeyad H. Al-Sowygh [a,*], Abdulmohsen A. Alfadley [b], Mohammed I. Al-Saif [c], Saleh H. Al-Wadei [d]

[a] Department of Prosthetic Dental Sciences, College of Dentistry, King Saud University, Riyadh, Saudi Arabia
[b] Division of Endodontics, College of Dentistry, King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia
[c] Department of Periodontics and Community Dentistry, College of Dentistry, King Saud University, Riyadh, Saudi Arabia
[d] Department of Pediatric Dentistry and Orthodontics, College of Dentistry, Alkharj University, Alkharj, Saudi Arabia

Received 3 November 2011; accepted 20 March 2012
Available online 8 December 2012

KEYWORDS
Dental environmental stress questionnaire;
Educational measurement;
Psychological;
Dental psychology

Abstract Dental education programs must make every effort to balance the demands of academic and clinical training of students, provide a reasonable quality of life and adequately prepare them for the continuing stress involved in the profession. This challenge has led to considerable interest in identifying sources of stress for students in dental education programs. Our study was structured with a prime objective of determining the perceived causes of stress among undergraduate dental students of the academic year 2009–10, at the College of Dentistry, King Saud University, Riyadh, Saudi Arabia. Four hundred and twenty-five students participated with the overall response rate of 76.4%. This cross-sectional, questionnaire-based survey was carried out in the study population utilizing the 41-item modified Dental Environmental Stress (DES) scale, to assess the sources of stress and its severity. Descriptive statistics were calculated for severity and sources of stress. Results indicated that there was a positive recalibration of student perceptions in the areas of transition from preclinical to clinical level; "Performance pressure" stressed third year students the most. However, "Clinical requirements" was the greatest stressor with the highest mean for the fourth and fifth year students. The mean value of total DES score of female students is also statistically higher than that of male students ($p < 0.05$). The item scores "Patient treatment", "performance pressure" and "social stressors" are significantly more stressful in married than in the single study subjects ($p < 0.05$). The overall findings of this investigation showed that dental students of King Saud University, perceived high levels of stress across all of the five study years with notable significance in the factor domain of "Workload".
© 2012 King Saud University. Production and hosting by Elsevier B.V.
Open access under CC BY-NC-ND license.

* Corresponding author. Address: Department of Prosthetic Dental Sciences, College of Dentistry, King Saud University, P.O. Box 60169, Riyadh 11545, Saudi Arabia.
E-mail address: alsowygh@gmail.com (Z.H. Al-Sowygh).
Peer review under responsibility of King Saud University.

ELSEVIER Production and hosting by Elsevier

1. Introduction

Everything in life, even the seemingly fundamental dissimilarity from the inanimate, is a matter of degree that is why no other generalization about life can be wholly true. Stress is a subjective sensation with a varied degree of perception [12]. Stress includes a wide range of strong external stimuli, both physiological and psychological, which can cause a

2210-8157 © 2012 King Saud University. Production and hosting by Elsevier B.V. Open access under CC BY-NC-ND license.
http://dx.doi.org/10.1016/j.ksujds.2012.11.002

physiological response called the general adaptation syndrome, first described in 1936 by Hans Selye in the journal Nature. The transition from **Eustress** (curative stress or positive form of stress) to **distress** (having negative implications) occurs when the demands exceed the personal and social resources the individual is able to mobilize [30]. The stressful nature of dentistry starts early as dental students are expected to acquire a wide range of knowledge and a variety of skills to help them succeed in their studies, and also in their future career [22]. This stress can result in physical and psychological distress, which in turn can affect the well-being and performance of the student [2,35]. Symptoms of distress include anxiety, depression, phobia, hostility, fear and tension, as well as physical complaints such as sleeplessness, fatigue, dizziness, tachycardia, and gastrointestinal system distress [25].

Stress is simply defined as a strain that accompanies a demand perceived to be either challenging (positive) or threatening (negative) and, depending on the appraisal, either adaptive or debilitating [10]. One debilitating reaction to stress is anxiety, which is the only measure of stress that has been used to test the academic performance of dental students, to date. In general, anxiety is reported to be predictive of reduced performance [28]. Further, stress is influenced by the person's system of beliefs and attitudes [10]. These self-cognitions mediate the perceived stressors and consequent behavior, resulting in either positive or negative consequences [25]. A longitudinal study of first-year dental students attending several US dental schools showed that, stress is related to detrimental effects on performance and health and that the amount and sources of stress change over time [31].

Although, there are conflicting data on the impact of stress on the academic performance of dental students [28], there is existing evidence in the literature indicating that high levels of perceived stress subsequently results in psychological morbidity, and emotional exhaustion among dental students. This may predispose them to professional burnout and decreased productivity [8]. In the United States these levels of depression, anxiety, and hostility in dental students have been reported as close to the norms for psychiatric outpatients [18].

In a multi-country study, Polychronopoulos and Divaris [22] reported self-efficacy beliefs, assigned workload, and performance pressure as the main perceived stressors in six European dental schools. Examinations, fear of failing, workload and completing course requirements ranked highest among stressors related to dental student training and the academic environment [25,7]. This is consistent with the findings of other studies [25,21]. In a study investigating sources of stress and psychological disturbance among dental students, Naidu et al. [18] found that fear of failing and examinations to be the only two stressors that appeared across all five study years. Several studies observed that mean stress scores increased through the study years with a peak in the third year, which is the transition from preclinical to clinical courses [18,10,1]. Also, longitudinal changes in dental students' stress perceptions corresponded with transitions in the didactic, preclinical, and clinical phases of the curriculum [23]. Additionally, during the period of clinical training, students are exposed to stressors analogous to those of dental practitioners [33]. Consequently, the objective of our questionnaire based cross sectional study was to understand in a comprehensive way how dental students experience and perceive stress.

2. Materials and methods

A cross sectional questionnaire based anonymous study was conducted during the middle of the first semester of the academic year 2009–10, at the College of Dentistry, King Saud University, Saudi Arabia.

2.1. Study sample

The study population comprised of undergraduate dental students from the first to fifth years enrolled in the Bachelor of Dental Surgery (BDS) program. The study population did not include any students from the university preparatory year before Dental College selection. The undergraduate course comprises 5 years: years 1 and 2 deal mainly with medical and preclinical curricula, while the clinical training along with didactic courses is intensely distributed in the three subsequent years. Education of males and females is segregated, with separate clinics and classes conducted on different campuses for each. Ethical approval for performing the study was obtained from the College of Dentistry-Research Center (CDRC). The purpose of the study was communicated in advance to the students, and student participation in the research was voluntary.

2.2. Questionnaire

The instrument of study used in this research was based on the Dental Environment Stress (DES) questionnaire [5] relevant to young undergraduate dental student populations. The DES questionnaire was modified to make it applicable to a Saudi Arabian background by removing and adding some items. The modified version contained 41 stress-related items; 25 items were used per se from the original DES questionnaire, whereas 16 items were added after a review of all modified versions of DES published in the literature [11,10,18,22,1,26,14,32]. Further, the questionnaire was translated into Arabic language. The reliability and validity (content, construct and face) of the modified questionnaire were assessed. Demographic information (class, gender, and age) was also obtained. Students were asked to respond to the questionnaire items (on a four-point Likert scale) as ''not stressful at all'', ''somewhat stressful'', ''quite stressful'', and ''very stressful'', and a fifth possible response of not applicable. For clarity of presentation the questionnaire items were categorized into seven main groups of stress-provoking domains (factors): self-efficacy beliefs (items 1–9), faculty and administration (items 10–19), workload (items 20–25), patient treatment (items 26–29), clinical training (items 30–33), performance pressure (items 34–36), and social stressors (items 37–41). The above mentioned categories were not shown in the questionnaire.

2.3. Statistical analysis

The data were analyzed using the Statistical Package for the Social Sciences statistical software (SPSS Pc+ version 16.0). Descriptive statistics (Proportion, mean and standard deviation) were used to describe the study and outcome variables. Internal consistency of the questionnaire was assessed by calculating Cronbach's alpha. Mann–Whitney test was used to determine the significant differences between

genders and marital status. Kruskal–Wallis test was employed to determine significant differences between class levels, and pair wise comparison test was used to assess difference between pairs of individual years. The level of significance was set at $p < 0.05$.

2.4. Reliability and validity of modified DES questionnaire

Overall reliability of the test items and items in each of the seven factors was assessed by calculating Cronbach's alpha. The reliability of the questionnaire with all items (41) was 0.895, which indicates significant internal consistency.

Scale 1 contained nine items referring to self-efficacy beliefs (e.g. Lack of confidence to be a successful dental student; Cronbach's alpha for internal consistency between the items was 0.765); scale 2 comprised 10 items dealing with faculty and administration (e.g. Receiving criticism about work being clinical (or) academic; Cronbach's alpha – 0.767); scale 3 included six items related to workload (e.g. Amount of assigned class work; Cronbach's alpha – 0.760); the fourth scale with four items represented statements referring to patient treatment (Lack of cooperation of patients in their home care; Cronbach's alpha – 0.89); a fifth scale included four items that represented statements referring to clinical training (e.g. Difficulty in learning clinical procedures; Cronbach's alpha – 0.694); the sixth scale with three items represented the performance pressure (e.g. Examination and grades experienced by the students; Cronbach's alpha – 0.653); and the last scale included five personal items referring to social stressors (e.g. Lack of home atmosphere in living quarters; Cronbach's alpha – 0.734). The adequacy of items under each of the factors was also assessed by calculating the range of Cronbach's alpha values (Table 1).

3. Results

3.1. Demographic profile

A total of 425 students of the 556 registered undergraduate students participated in the study giving an overall response rate of 76.4%. The response rate of males and females of all the years were 68.9% and 31.1%, respectively. Response rates by the year of study were 70.8% for the first year students, 64% for the second year students, 83.8% for the third year students, 89% for the fourth year students, and 77% for the fifth year students. The mean age for the students was 21.5 years with a range of 18–25 years. The majority (95.7%) of the respondents were single and 4.3% were married. The demographic characteristics of study subjects are presented in Table 2.

Table 2 Socio-demographic characteristics of the participants.

Variables (*N*)	*n* (%)
Total participants (556)	425 (76.4)
Gender	
Male (348)	293 (68.9)
Female (208)	132 (31.1)
Study year	
Year 1 (113)	80 (18.8)
Year 2 (118)	75 (17.7)
Year 3 (105)	88 (20.7)
Year 4 (108)	96 (22.6)
Year 5 (112)	86 (20.2)
Age (*years*)	
Mean (±S.D.)	21.52 (±1.54)
Median	22
Range	18–25
Marital status	
Unmarried	407 (95.7)
Married	18 (4.3)

3.2. Stress levels

The mean DES scores were compared across all classes. Stress scores for each item under each of the seven stressor domains (factors) are summarized in Table 3. Items related to Workload scored the highest DES scores among stressors, "Amount of assigned class work" (Mean = 3.52, SD = 0.79) and "Late ending day" (Mean = 3.52, SD 0.81) were the most stressful item, followed by "Lack of time for relaxation" (Mean = 3.43, SD 0.79) (Table 5).

Items that were considered moderately to severely stressful were "Overloaded feeling due to heavy syllabus" (Mean = 3.37, SD 0.77), "Lack of time to do assigned school work" (Mean = 3.29, SD 0.84), "Difficulty of class work" (Mean = 3.22, SD 0.83), "Inconsistency of feedback on work between different instructors" (Mean = 3.12, SD 0.94), followed by "Competition for grades" (Mean = 3.07, SD 0.98). On the other hand, the majority of students felt only minimally stressed when faced with the following items: Necessity to postpone having children (Mean = 0.74, SD 1.17), and marital adjustment problems (Mean = 0.75, SD 1.18) (Table 3).

Table 1 Reliability of stress factors (sub scales) of DES questionnaire.

Factors (item numbers)	Cronbach's alpha	Cronbach's alpha if items deleted (range)
Self efficacy (1,2,3,4,5,6,7,8 & 9)	0.765	(0.732 to 0.776)
Faculty and administration (10,11,12,13,14,15,16,17,18 & 19)	0.767	(0.725 to 0.781)
Workload (20,21,22,23,24 & 25)	0.76	(0.703 to 0.749)
Patient training (26,27,28 & 29)	0.89	(0.847 to 0.873)
Clinical training (30,31,32 & 33)	0.694	(0.521 to 0.769)
Performance pressure (34,35 & 36)	0.653	(0.618 to 0.644)
Social stressors (37,38,39,40 & 41)	0.734	(0.655 to 0.753)
All items	0.895	(0.888 to 0.897)

Table 3 Mean Dental Environment Stress (DES) questionnaire scores and comparison among the five study years.

Category	Stressor	DES overall	DES by class					
			First year	Second year	Third year	Fourth year	Fifth year	Sig. level
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Self-efficacy beliefs	Fear of failing a course or the year	2.82 (1.06)	2.90 (1.09)	2.81 (1.12)	2.88 (1.06)	2.84 (1.01)	2.69 (1.03)	NS
	Fear of being unable to catch up if behind	2.52 (1.16)	2.11 (1.11)	2.68 (1.15)	2.42 (1.16)	2.68 (1.13)	2.72 (1.16)	<0.001 (1 < 2,4,5)
	Lack of confidence to be a successful dental student	2.34 (1.01)	2.33 (1.07)	2.45 (0.94)	2.15 (1.05)	2.46 (0.92)	2.31 (1.03)	NS
	Fear of not being able to join a post graduate dental education program	2.26 (1.14)	1.96 (1.21)	2.00 (1.17)	2.29 (1.12)	2.60 (1.07)	2.40 (1.03)	<0.001 (3 < 4 & 1,2 < 4,5)
	Insecurity concerning professional future	2.22 (1.11)	2.13 (1.07)	2.32 (1.18)	1.94 (1.05)	2.41 (1.16)	2.33 (1.03)	<0.04 (3 < 4,5)
	Insecurity concerning lack of employment positions	2.18 (1.14)	2.29 (1.15)	2.27 (1.15)	1.85 (1.07)	2.34 (1.25)	2.19 (1.03)	<0.03 (3 < 1,2,4,5)
	Lack of confidence in own decision making	1.99 (1.02)	1.93 (1.02)	1.77 (1.03)	2.10 (1.04)	1.96 (1.04)	2.18 (0.95)	NS
	Language barrier	1.99 (1.04)	2.25 (1.07)	2.07 (1.07)	1.93 (0.97)	1.82 (1.01)	1.94 (1.03)	<0.05 (3,4,5 < 1)
	Lack of confidence to be a successful dentist	1.95 (1.09)	2.03 (1.14)	2.12 (1.00)	1.84 (0.99)	1.90 (1.21)	1.92 (1.07)	NS
Faculty and administration	Inconsistency of feedback on work between different instructors	3.11 (0.94)	2.88 (1.13)	3.03 (1.05)	3.26 (0.92)	3.07 (0.84)	3.31 (0.71)	NS
	Receiving criticism about work	3.00 (0.97)	2.66 (1.04)	2.87 (0.93)	2.90 (1.05)	3.39 (0.81)	3.13 (0.89)	<0.001 (1,2,3,5 < 4 & 1,2 < 5)
	Being treated as immature & irresponsible by faculty	2.91 (1.15)	2.21 (1.32)	2.57 (1.16)	2.95 (1.15)	3.39 (0.83)	3.30 (0.84)	<0.001 (1,2 < 3,4,5)
	Availability of qualified laboratory technicians	2.65 (1.34)	1.40 (1.22)	1.89 (1.19)	2.70 (1.21)	3.25 (0.87)	3.78 (0.52)	<0.001 (3 < 4,5 & 4 < 5)
	Lack of input into the decision-making process of school	2.64 (1.16)	2.22 (1.18)	2.42 (1.21)	2.66 (1.17)	2.99 (1.06)	2.83 (1.04)	<0.001 (1 < 3 & 1,2 < 4,5)
	Getting study material	2.56 (1.01)	2.33 (1.16)	2.99 (0.89)	2.94 (0.91)	2.46 (0.92)	2.16 (0.81)	<0.001 (1,4,5 < 2,3)
	Shortage of allocated laboratory time	2.47 (1.21)	2.18 (1.31)	2.35 (1.15)	2.72 (1.24)	2.50 (1.21)	2.57 (1.10)	<0.05 (2 < 3 & 1 < 3,5)
	Inadequate number of instructors in relation to student	2.45 (1.19)	1.54 (1.01)	1.96 (1.13)	2.48 (1.07)	2.76 (1.06)	3.40 (0.71)	<0.001 (1,2 < 3,4,5)
	Shortage of allocated clinical time	2.10 (1.51)	1.00 (1.47)	1.22 (1.54)	2.75 (1.20)	2.79 (1.18)	2.68 (1.09)	NS
	Amount of cheating in dental school	1.90 (1.35)	1.59 (1.27)	1.79 (1.39)	1.95 (1.22)	1.88 (1.46)	2.27 (1.33)	<0.02 (1,2 < 5 & 1 < 3)
Workload	Amount of assigned class work	3.52 (0.79)	3.18 (0.94)	3.53 (0.81)	3.53 (0.93)	3.75 (0.54)	3.58 (0.56)	<0.001 (1 < 2,3,4,5)
	Difficulty of class work	3.22 (0.83)	3.04 (0.87)	3.32 (0.85)	3.22 (0.89)	3.40 (0.73)	3.11 (0.79)	<0.02 (5 < 4 & 1 < 2,4)
	Late ending day	3.52 (0.81)	3.31 (0.99)	3.57 (0.74)	3.51 (0.83)	3.71 (0.62)	3.49 (0.82)	NS
	Lack of time for relaxation	3.43 (0.79)	3.11 (0.97)	3.47 (0.70)	3.57 (0.71)	3.61 (0.70)	3.33 (0.75)	<0.001 (5 < 4,3 & 1 < 2,3,4)
	Overloaded feeling due to huge syllabus	3.37 (0.77)	3.46 (0.71)	3.65 (0.65)	3.24 (0.91)	3.46 (0.66)	3.10 (0.77)	<0.001 (5 < 1,4 & 3,4,5 < 2)
	Lack of time to do assigned school work	3.29 (0.84)	3.11 (1.03)	3.36 (0.84)	3.41 (0.85)	3.48 (0.66)	3.08 (0.74)	<0.001 (5 < 2,3,4)
Patient treatment	Patients being late or not showing for their appointments	2.61 (1.61)	1.08 (1.54)	1.01 (1.57)	3.32 (0.87)	3.65 (0.58)	3.49 (0.75)	<0.001 (3 < 4)
	Lack of cooperation by patients in their home care	2.12 (1.42)	1.14 (1.52)	0.85 (1.31)	2.49 (1.07)	2.92 (0.93)	2.83 (0.86)	<0.001 (3 < 4,5)
	Fear of dealing with patients who do not disclose the existence of a contagious disease	2.07 (1.37)	1.20 (1.51)	1.28 (1.61)	2.64 (0.98)	2.69 (1.05)	2.28 (0.93)	<0.001 (5 < 3,4)
	Working on patients with dirty mouths	2.00 (1.35)	1.27 (1.58)	1.03 (1.47)	2.45 (0.97)	2.57 (0.96)	2.41 (0.95)	NS
Clinical training	Responsibility of getting suitable patients	2.76 (1.51)	1.09 (1.50)	1.69 (1.63)	3.39 (0.86)	3.68 (0.53)	3.49 (0.72)	<0.001 (3 < 4)
	Difficulty in learning precision manual skills required in preclinical work	2.33 (1.02)	2.36 (1.11)	2.57 (1.03)	2.38 (1.03)	2.14 (0.96)	2.30 (0.95)	NS
	Transition from pre-clinic to clinic work	2.22 (1.25)	1.26 (1.47)	2.28 (1.55)	2.58 (0.96)	2.40 (0.90)	2.44 (0.88)	<0.001 (1 < 2,3,4,5)
	Difficulty in learning clinical procedures	1.90 (1.23)	1.18 (1.47)	1.20 (1.38)	2.55 (0.98)	2.15 (0.87)	2.21 (0.77)	<0.001 (4,5 < 3)

Performance pressure	Competition for grades	3.07 (0.98)	3.03 (1.05)	3.00 (1.01)	3.18 (0.92)	3.08 (1.04)	3.05 (0.89)	NS
	Examinations and quizzes	2.83 (0.96)	2.78 (1.02)	2.61 (0.97)	3.06 (0.88)	2.84 (1.01)	2.81 (0.89)	NS
	Clinical requirements	2.70 (1.62)	0.95 (1.36)	1.04 (1.39)	3.39 (0.91)	3.78 (0.51)	3.79 (0.54)	< 0.001 (3 $<$ 4,5)
Social stressors	Lack of home atmosphere in living quarters	1.88 (1.42)	1.90 (1.35)	1.73 (1.39)	1.75 (1.51)	2.18 (1.44)	1.80 (1.39)	NS
	Financial responsibilities	1.88 (1.50)	1.78 (1.43)	1.81 (1.50)	1.65 (1.62)	1.85 (1.61)	2.29 (1.26)	NS
	Forced postponement of marriage or engagement	1.79 (1.47)	1.68 (1.52)	1.73 (1.43)	1.69 (1.51)	1.84 (1.55)	1.99 (1.32)	NS
	Marital adjustments problems	0.75 (1.18)	0.91 (1.32)	0.67 (1.11)	0.49 (0.85)	0.85 (1.31)	0.84 (1.20)	NS
	Necessity to postpone having children	0.74 (1.17)	0.85 (1.22)	0.65 (1.16)	0.51 (0.88)	0.93 (1.39)	0.74 (1.09)	NS

Data presented as mean ± standard deviation (statistical significance at $p < 0.05$).

3.3. Stress levels and stress associated variables

Comparing the level of stress across each of the five years, the first and second year students shared the same feeling about stressors and showed the highest mean scores for the items ''Overloaded feeling due to heavy syllabus'', followed by ''Late ending day'', and ''Amount of assigned class work''. Third year students showed more perceived stress in the items related to performance pressure as evidence of the effect of transition from preclinical to clinical level, however workload items were still the greatest stressors for this year. ''Clinical requirements'' was the greatest stressor with the highest mean for the fourth and fifth year students (Table 3).

There were some statistically significant differences between the levels of stress for specific stressors across the five study years. For example, first-year students perceived ''Language barrier'' to be significantly more stressful than the three clinical year students (Years 3, 4, and 5). Compared to all other years, first-year students were the least stressed concerning ''Amount of assigned class work'' and ''Transition from pre-clinic to clinic work''. However, third-year students found ''Difficulty in learning clinical procedures'' to be significantly more stressful than fourth and fifth year students.

In contrast to first and second-year students, the clinical year students found ''Being treated as immature & irresponsible by faculty'' and ''Inadequate number of instructors in relation to number of students'' more stressful. ''Difficulty in learning clinical procedures'' and ''Responsibility of getting suitable patients'' were significantly more stressful for the fourth-year students than for students in year 3. Third and fourth-year students found ''Fear of dealing with patients who do not disclose the existence of a contagious disease'' to be significantly more stressful than final year students (year 5) (Table 3). Fourth and fifth-year students reported ''Fear of not being able to join a post graduate dental education program'' and ''Lack of input into the decision-making process of school'' to be significantly more stressful than the two preclinical year students (years 1 and 2). Compared to year three, fourth and fifth-year students rated ''Insecurity concerning professional future'', ''Lack of cooperation by patients in their home care'', and ''Clinical requirements'' to be significantly more stressful''.

As evident in Table 4, female students perceived more stress than males, as there is a significant difference in the mean values of the majority of the stressors between males and females ($p < 0.05$). The mean value of the total DES score of female students is also statistically significantly higher than that of male students ($p < 0.05$). However, the items pertaining to social stressors were incurred to be statistically insignificant when compared among the male and female students ($p > 0.05$) (Table 4).

Life changes such as marriage can be perceived as stressful because they result in new demands and pressures. Out of the 41 items used to assess stress, the stressor under the title of patient treatment, performance pressure and social stressors are significantly different between married and single study subjects ($p < 0.05$). That is married subjects are having higher mean values of score than the single study subjects. Whereas, there is no testimony to the statistical significance in the mean values of the stressors under the grouping of self efficacy beliefs, faculty administration, workload and clinical training. This stands true also with the total score ($p > 0.05$) when based on the marital status (Tables 4 and 5).

Table 4 Mean Dental Environment Stress (DES) questionnaire score and comparison among gender and marital status.

Category	Stressor	DES by gender			DES by marital status		
		Male	Female	Sig. level	Single	Married	Sig. level
		Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Self-efficacy beliefs	Fear of failing a course or the year	2.18 (1.00)	2.69 (0.94)	< 0.001	2.83 (1.07)	1.72 (0.96)	NS
	Fear of being unable to catch up if behind	2.19 (1.03)	1.57 (0.91)	< 0.001	2.53 (1.16)	2.50 (1.29)	NS
	Lack of confidence to be a successful dental student	2.90 (1.04)	2.66 (1.08)	< 0.03	2.34 (1.02)	2.33 (0.59)	NS
	Fear of not being able to join a post graduate dental education program	2.42 (1.16)	2.77 (1.13)	< 0.001	2.29 (1.14)	1.94 (1.06)	NS
	Insecurity concerning professional future	1.88 (0.97)	2.23 (1.08)	< 0.001	2.25 (1.11)	1.72 (1.07)	0.04
	Insecurity concerning lack of employment positions	2.25 (1.11)	2.30 (1.20)	NS	2.19 (1.14)	2.06 (1.21)	NS
	Lack of confidence in own decision making	2.13 (1.03)	2.45 (1.24)	< 0.01	1.97 (1.08)	1.50 (1.15)	< 0.04
	Language barrier	2.12 (1.11)	2.33 (1.21)	NS	2.00 (1.04)	1.72 (0.96)	NS
	Lack of confidence to be a successful dentist	1.85 (1.00)	2.18 (1.24)	< 0.01	2.34 (1.02)	2.33 (0.59)	NS
Faculty and administration	Inconsistency of feedback on work between different instructors	2.54 (1.03)	2.63 (0.97)	NS	3.12 (0.94)	2.83 (1.25)	NS
	Receiving criticism about work	2.05 (1.37)	1.58 (1.24)	< 0.001	3.02 (0.97)	2.89 (0.96)	NS
	Being treated as immature & irresponsible by faculty	2.55 (1.21)	2.84 (1.03)	< 0.03	2.93 (1.14)	2.83 (1.25)	NS
	Availability of qualified laboratory technicians	2.89 (1.01)	3.25 (0.83)	< 0.001	2.65 (1.35)	2.94 (1.16)	NS
	Lack of input into the decision-making process of school	2.24 (1.17)	2.98 (1.16)	< 0.001	2.66 (1.16)	2.39 (1.04)	NS
	Getting study material	1.96 (1.45)	2.58 (1.55)	< 0.001	2.59 (1.01)	2.11 (0.90)	< 0.04
	Shortage of allocated laboratory time	2.82 (1.18)	3.12 (1.06)	< 0.01	2.48 (1.21)	2.06 (1.35)	NS
	Inadequate number of instructors in relation to student	3.06 (0.95)	3.24 (0.91)	< 0.05	2.43 (1.19)	3.00 (0.84)	< 0.05
	Shortage of allocated clinical time	2.48 (1.17)	2.42 (1.23)	NS	2.16 (1.51)	2.00 (1.37)	NS
	Amount of cheating in dental school	2.65 (1.32)	2.68 (1.37)	NS	1.94 (1.36)	1.28 (0.96)	< 0.05
Workload	Amount of assigned class work	3.41 (0.85)	3.77 (0.56)	< 0.001	3.54 (0.78)	3.33 (0.84)	NS
	Difficulty of class work	3.14 (0.85)	3.39 (0.77)	< 0.001	3.22 (0.83)	3.17 (0.86)	NS
	Late ending day	3.16 (0.89)	3.58 (0.63)	< 0.001	3.53 (0.81)	3.44 (0.92)	NS
	Lack of time for relaxation	3.30 (0.81)	3.55 (0.62)	< 0.001	3.42 (0.79)	3.50 (0.71)	NS
	Overloaded feeling due to huge syllabus	3.37 (0.81)	3.55 (0.72)	< 0.02	3.39 (0.76)	3.00 (0.77)	< 0.02
	Lack of time to do assigned school work	3.50 (0.83)	3.58 (0.77)	NS	3.30 (0.83)	3.22 (0.81)	NS
Patient treatment	Patients being late or not showing for their appointments	1.99 (1.42)	2.42 (1.40)	< 0.001	2.59 (1.63)	3.22 (1.06)	NS
	Lack of cooperation by patients in their home care	1.87 (1.33)	2.32 (1.35)	< 0.001	2.12 (1.43)	2.56 (1.10)	NS
	Fear of dealing with patients who do not disclose the existence of a contagious disease	2.51 (1.62)	2.84 (1.58)	< 0.02	2.06 (1.39)	2.50 (0.92)	NS
	Working on patients with dirty mouths	1.97 (1.36)	2.32 (1.37)	< 0.01	1.99 (1.35)	2.61 (1.20)	< 0.05
Clinical training	Responsibility of getting suitable patients	2.27 (0.98)	2.49 (1.09)	< 0.02	2.75 (1.52)	3.28 (1.02)	NS
	Difficulty in learning precision manual skills required in preclinical work	2.18 (1.25)	2.30 (1.24)	NS	2.35 (1.03)	2.28 (0.96)	NS
	Transition from pre-clinic to clinic work	1.90 (1.23)	1.92 (1.24)	NS	2.21 (1.26)	2.39 (1.09)	NS
	Difficulty in learning clinical procedures	2.63 (1.54)	3.06 (1.41)	< 0.001	1.89 (1.24)	2.24 (1.09)	NS
Performance pressure	Competition for grades	2.74 (0.98)	3.02 (0.89)	< 0.01	3.07 (0.98)	3.11 (1.02)	NS
	Examinations and quizzes	3.01 (0.94)	3.20 (1.04)	< 0.01	2.81 (0.96)	3.22 (0.94)	NS
	Clinical requirements	2.59 (1.64)	2.95 (1.54)	< 0.02	2.68 (1.62)	3.33 (1.28)	NS
Social stressors	Lack of home atmosphere in living quarters	1.83 (1.35)	2.00 (1.56)	NS	1.86 (1.43)	2.24 (1.39)	NS
	Financial responsibilities	1.86 (1.48)	1.63 (1.44)	NS	1.85 (1.50)	2.11 (1.37)	NS
	Forced postponement of marriage or engagement	0.74 (1.13)	0.78 (1.28)	NS	1.76 (1.46)	2.00 (1.50)	NS
	Marital adjustment problems	0.69 (1.09)	0.85 (1.32)	NS	0.68 (1.12)	2.28 (1.18)	< 0.001
	Necessity to postpone having children	2.09 (1.49)	1.41 (1.44)	< 0.001	0.66 (1.10)	2.28 (1.32)	< 0.001

Data presented as mean ± standard deviation (statistical significance at $p < 0.05$).

Table 5 Comparison of the five most potential stressors among study year, gender and marital status.

Stressor category	Stressors	Comparison among variables	
Year of study			
		Preclinical	Clinical
Workload	Amount of assigned class work	3.53 (0.93)	3.75 (0.54
Workload	Late ending day	3.57 (0.74)	3.71 (0.62)
Workload	Lack of time for relaxation	3.57 (0.71)	3.33 (0.75)
Workload	Overloaded feeling due to huge syllabus	3.65 (0.65)	3.46 (0.66)
Workload	Lack of time to do assigned school work	3.46 (0.71)	3.48 (0.67)
Gender			
		Male	Female
Workload	Late ending day	3.50(0.82)	3.58(0.77)
Workload	Amount of assigned class work	3.41(0.81)	3.77(0.56)
Workload	Lack of time for relaxation	3.30(0.82)	3.55(0.62)
Workload	Overloaded feeling due to huge syllabus	3.30(0.82)	3.55(0.62)
Workload	Lack of time to do assigned school work	3.16(0.89)	3.58(0.63)
Marital Status			
		Single	Married
Workload	Late ending day	3.54(0.78)	3.33(0.84)
Workload	Amount of assigned class work	3.54(0.78)	3.33(0.84)
Workload	Lack of time to do assigned school work	3.53(0.81)	3.44(0.92)
Workload	Overloaded feeling due to huge syllabus	3.42(0.79)	3.50(0.71)
Workload	Lack of time for relaxation	3.39(0.76)	3.00(0.77)

4. Discussion

The main objective of this study was to identify the perceived causes of stress among dental students at the College of Dentistry, King Saud University, Riyadh, Saudi Arabia. Identifying possible causes of stress may provide staff and administration an opportunity to alleviate student's stress through modifying the teaching curriculum or environment, as well as adopting strategies for stress management and providing resources to help reduce stress in dental education.

Regardless of the gender and year it was found that ''Workload'' accounted for most of the stress experienced by students. This is consistent with the findings of other studies [11,5]. As the student advances to the clinic level, they must be able to (a) apply didactic information to clinic situations, (b) provide total patient care, and (c) perform numerous laboratory procedures, i.e., mixing materials, grinding models, carving, and polishing crowns and dentures. Wegman [34] investigated the body postures of students and found that as students assumed unnatural body postures, there was an increase in physical stress that adversely affected work performance. A comparative study of professional students' stress showed that dental students had greater levels of stress than medical students owing to additional technical excellence required in dentistry [16]. Over the course of the dental school experience, the effects of such behavior are cumulative and continuous stress.

The overall mean stress scores were observed to increase through the year of study. This is consistent with the findings of other studies [18,27,37]. Examination of the stress scores by the year of study showed that preclinical students (first year and second year students) shared the same feeling where stressors showed highest mean scores for the items ''Overloaded feeling due to huge syllabus'', followed by ''Late ending day'', and ''Amount of assigned class-work''.

Third-year students regarded ''Lack of time for relaxation'' to be the biggest stressor. This may indicate that the introduction to clinical environment is a stressful event as well as difficulties in making a balance between academic tasks, clinical activities, and social life [3]. The transition from being a predominantly preclinical science student at the end of Year 2 to being an apprentice doctor on the ward at the beginning of Year 3 was the most frequently described stressful transition, with changes in learning environment, teaching styles and expectations cited as particular causes of stress [14,13]. ''Clinical requirements'' was the greatest stressor with the highest mean score for the fourth and fifth-year students. This can be explained by the fact that finishing clinical requirements is an integral part of each clinical course that should be fulfilled in order for the student to pass to the next level. A study conducted in Malaysia reported similar findings: the requirement system of dental procedures received the highest stress scores for final-year students [26].

Specifically within the years of study, significant differences in the present study were identified. For example, first-year students, who might be at a stage of adjusting to the new teaching language, found ''Language barrier'' significantly more stressful than third, fourth, and fifth-year students. The language barrier issue is one that has been extensively discussed with regard to patient care. However, similar data on dental students are lacking, especially in a country where although English is the medium of college education, a majority of the students study English as a second language, thus suggesting an area of possible future research.

Third-year students, who might be required to practice advanced laboratory procedures, found ''Shortage of allocated laboratory time'' significantly more stressful than first and second-year students. Fourth and fifth-year students, who are expected to be more anxious about their future careers, found ''Fear of not having possibility to pursue a post graduate dental education program'' significantly more stressful than students in years 1 and 2. Third-year students, who are less exposed to clinical dentistry, found ''Difficulty in learning clinical procedures'' more stressful than students in years 4

and 5 [24]. Clinical year students, who are expected to finish a certain number of cases under close clinical supervision, rated ''Inadequate number of instructors in relation to students'' to be significantly more stressful than first and second-year students. In a similar study assessing perceived stressors of dental student of Manchester University, Heath et al. [7] found that potential stressors included: (1) information-input overload, (2) fear of not completing the quantity and variety of work, (3) inadequate and conflicting feedback regarding performance and, (4) approachability of faculty and staff. George et al. [6] revealed that there were associations between personalities of dental students and stress levels. As for Australian dental students, it was found that perceptions of stress were due to an underlying tendency toward perfectionism based on an academic history of high achievement and powerful expectations of scholastic excellence [27].

Fourth-year students, who are required to find clinical cases for different college courses, reported ''Responsibility of getting suitable patients'' to be more stressful than third-year students (Table 5). Final year students found ''Fear of dealing with patients who do not disclose the existence of a contagious disease'' less stressful than third and fourth year students, possibly due to them being more familiar with the practice of infection control measures.

In our study, there is statistical significance wherein females generally perceived more stress than males. This is in agreement with the findings of other studies [18,5,36,20,13]. But in contrast, a study conducted by Kumar et al. [10] showed that males expressed higher levels of stress. The fact that female students report significantly higher distress has been explained by Sanders and Lushington that in addition to differing patterns of psychological morbidity, males are simply less expressive of their concern [27].

Examination of stress scores by marital status showed that married subjects perceived more stress than single study subjects related to patient treatment, performance pressure and social stressors. This proved positive in correlation to other studies [17,15,19]. However married subjects reporting higher stress scores related to patient treatment and performance pressure factors was in agreement with one recent report on the Saudi population, but was contradictory to previous studies done on different ethnic groups, which did not report any significant stress scores other than the social stressors [17,15]. Further investigations are needed to address this matter.

According to Dodge et al. [4] students report significantly lower stress when clinical training and evaluation are not based on unit requirements. In addition, the reconsideration of the existing educational system toward a more student-centered orientation could facilitate collaborative learning and reduce stress caused by academic domains [9]. According to Schwartz et al. [29] the establishment of student advisors and counselors within a dental school, combined with a faculty advising system and student-oriented programs, have contributed to an improved educational environment. Hence a stress reduction plan should be implemented with special attention toward female dental students. It appears that modification of the teaching curriculum and environment, as well as adopting strategies for stress management and providing resources to help reduce stress in dental education is important to help students succeed.

Our study did have some limitations, being organized as a cross-sectional design, which investigates the real world at one point in time. Such a design does not examine longitudinal fluctuations in perceived stressors over time. Since the information was collected on self-administered questionnaires/instruments we cannot rule out information bias.

5. Conclusion

During the first few months of their program, as the students struggle to understand their new environment, we found that students report increased psychological symptoms and this cumulates all through the five study years. Dental educators can support students in this process by ensuring that the students have realistic expectations about the program and its demands/effects on them, as well as information about student services and encouragement to access them in a proactive manner. The findings of this study suggest that academic and clinical workloads are the primary sources of stress among dental students in King Saud University. The female students and the married perceived more stress than males and the single study subjects.

Acknowledgements

The Authors acknowledge Dr. Shaffi Ahamed for his assistance in statistical analysis and Dr. Chalini Sundar for her help in editing the manuscript. A special thanks to all the students of College of Dentistry, King Saud University, Saudi Arabia who participated and contributed to this study.

References

[1] Acharya S. Factors affecting stress among Indian dental students. J Dent Educ 2003;67:1140–8.
[2] Cecchini JJ, Friedman N. First-year dental students: relationship between stress and performance. Int J Psychosom 1987;34:17–9.
[3] Dahan H, Bedos C. A typology of dental students according to their experience of stress: a qualitative study. J Dent Educ 2010;74:95–103.
[4] Dodge WW, Dale RA, Hendricson WD. A preliminary study of the effect of eliminating requirements on clinical performance. J Dent Educ 1993;57(9):667–72.
[5] Garbee Jr WH, Zucker SB, Selby GR. Perceived sources of stress among dental students. J Am Dent Assoc 1980;100(6):853–7.
[6] George JM, Whitworth DE, Sturdevant JR, Lundeen TF. Correlates of dental student stress. J Dent Educ 1987;51(8):481–5.
[7] Heath JR, Macfarlane TV, Umar MS. Perceived sources of stress in dental students. Dent Update 1999;26(3):94–100.
[8] Humphris G, Blinkhorn A, Freeman R, Gorter R, Hoad-Reddick G, Murtomaa H, et al. Psychological stress in undergraduate dental students: baseline results from seven European dental schools. Eur J Dent Educ 2002;6:22–9.
[9] Kaufman A, Klepper D, Obenshain SS, Voorhees JD, Galey W, Duban S, et al. Undergraduate medical education for primary care: a case study in New Mexico. South Med J 1982;75(9):1110–7.
[10] Kumar S, Dagli RJ, Mathur A, Jain M, Prabu D, Kulkarni S. Perceived sources of stress amongst Indian dental students. Eur J Dent Educ 2009;13:39–45.
[11] Lamis DR. Perceived sources of stress among dental students at the University of Jordan. J Dent Educ 2001;65:232–41.
[12] Lefcourt HM. Personal and social characteristics that alter the impact of stressors. New York, NY: AMS Press; 1989.
[13] Mikolajczyk RT, Maxwell AE, Naydenova V, Meier S, El Ansari W. Depressive symptoms and perceived burdens related to being a

student: survey in three European countries. Clin Pract Epidemiol Ment Health 2008;4:19–27.
[14] Morse Z, Dravo U. Stress levels of dental students at the Fiji school of medicine. Eur J Dent Educ 2007;11:99–103.
[15] Muirhead V, Locker D. Canadian dental students' perceptions of stress. J Can Dent Assoc 2007;73:323.
[16] Murphy RJ, Gray SA, Sterling G, Reeves K, Du Cette J. A comparative study of professional student stress. Dent Educ 2009;73:328–37.
[17] Musser LA, Lloyd C. The relationship of marital status and living arrangement to stress among dental students. J Dent Educ 1985;49:573–8.
[18] Naidu RS, Adams JS, Simeon D, Persad S. Sources of stress and psychological disturbance among dental students in the West Indies. J Dent Educ 2002;66:1021–30.
[19] Pani SC, Al Askar AM, Al Mohrij SI, Al Ohali TA. Evaluation of stress in final-year Saudi dental students using salivary cortisol as a biomarker. J Dent Educ 2011;75(3):377–84.
[20] Pau A, Rowland ML, Naidoo S, AbdulKadir R, Makrynika E, Moraru R, et al. Emotional intelligence and perceived stress in dental undergraduates: a multinational survey. J Dent Educ 2007;71(2):197–204.
[21] Polychronopoulou A, Davis K. Perceived sources of stress among Greek dental students. J Dent Educ 2005;69:687–92.
[22] Polychronopoulou A, Divaris K. Dental students' perceived sources of stress: a multi-country study. J Dent Educ 2009;73:631–9.
[23] Polychronopoulou A, Divaris K. A longitudinal study of Greek dental students' perceived sources of stress. J Dent Educ 2010;74: 524–30.
[24] Radcliffe C, Lester H. Perceived stress during undergraduate medical training: a qualitative study. Med Educ 2003;37:32–8.
[25] Rajab LD. Perceived sources of stress among dental students at the University of Jordan. J Dent Educ 2001;65(3):232–41.
[26] Rosli TI, Abdul Rahman R, Abdul Rahman SR, Ramli R. A survey of perceived stress among undergraduate dental students in university Kebangsaan Malaysia. Singapore Dent J 2005;27: 17–22.
[27] Sanders AE, Lushington K. Sources of stress for Australian dental students. J Dent Educ 1999;63:688–97.
[28] Sanders AE, Lushington K. Effect of perceived stress on student performance in dental school. J Dent Educ 2002;66(1): 75–81.
[29] Schwartz RM, Eigenbrode CR, Cantor O. A comprehensive stress-reduction program for dental students. J Dent Educ 1984;48(4):203–7.
[30] Selye H. The stress of life. McGraw-Hill: New York; 1956.
[31] Silverstein ST, Kritz-Silverstein D. A longitudinal study of stress in first-year dental students. J Dent Educ 2010;74: 836–48.
[32] Sofola OO, Jeboda SO. Perceived sources of stress in Nigerian dental students. Eur J Dent Educ 2006;10:620–3.
[33] Thornton LJ, Staurt-Buttle C, Wyszynski TC, Wilson ER. Physical and psychological stress exposures in US dental schools: the need for expanded ergonomics training. Appl Ergon 2004;35(2):153–7.
[34] Wegman JE. The ergonomic posture in a preclinical technique exercise. J Dent Educ 1983;47(10):664–5.
[35] Westerman GH, Grandy TG, Lupo JV, Mitchell RE. Relationship of stress and performance among first-year dental students. J Dent Educ 1986;50(5):264–7.
[36] Westerman GH, Grandy TG, Ocanto RA, Erskine CG. Perceived sources of stress in dental school environment. J Dent Educ 1993;57:225–31.
[37] Yap AV, Bhole S, Teo CS. A cross-cultural comparison of perceived sources of stress in the dental school environment. J Dent Educ 1996;60:459–64.